

# Use of Complementary and Alternative Medicine Among Persons With Diabetes Mellitus: Results of a National Survey

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Despite recent advances in care and management, diabetes mellitus continues to be an important public health concern, causing substantial morbidity and mortality and long-term complications. In 1997, there were close to 16 million persons in the United States with diabetes (5%–6% of the general population).<sup>1</sup> With increasing rates of childhood and adult obesity, diabetes is expected to become even more prevalent in coming decades, and it remains a significant risk factor for the development of cardiovascular disease. In addition, the disease accounts for a substantial portion of US health care expenditures. According to estimates for 1998, 1 in 7 health care dollars and 25% of the Medicare budget were spent on the care of persons with diabetes.<sup>2–4</sup>

At the same time, the care of persons with diabetes has been influenced by a growing interest in complementary and alternative medicine (CAM). This interest, apparent not only among the general public but also among health care providers, researchers, and educators, has brought forth new clinical and research challenges.<sup>5,6</sup> In 2001, the American Diabetes Association issued a position statement on “unproven therapies” encouraging health care providers to ask their patients about alternative therapies and practices, evaluate each therapy’s effectiveness, be cognizant of any potential harm to patients, and acknowledge circumstances in which new and innovative diagnostic or therapeutic measures might be provided to patients.<sup>7</sup>

In addition, *Diabetes Spectrum* devoted 2 recent issues of the journal to CAM-related topics. These special issues presented some of the evidence for potentially promising alternative therapies (e.g., certain herbs or dietary supplements) and provided information on traditional systems of healing (e.g., traditional Chinese medicine or ayurveda) that introduce new ways of thinking about the diabetic dis-

**Objectives.** This study sought to characterize the use of complementary and alternative medicine (CAM) among persons with diabetes mellitus residing in the United States.

**Methods.** Data from a 1997–1998 national survey (n=2055) on CAM use were examined.

**Results.** Ninety-five respondents reported having diabetes, of whom 57% reported CAM use in the past year; fewer respondents (35%) reported use specifically for diabetes. Therapies used for diabetes included solitary prayer/spiritual practices (28%), herbal remedies (7%), commercial diets (6%), and folk remedies (3%). Excluding solitary prayer, only 20% of respondents used CAM to treat diabetes.

**Conclusions.** The prevalence of CAM therapy use among persons with diabetes is comparable to that among the general population. Use of CAM therapies specifically to treat diabetes, however, is much less common. (*Am J Public Health.* 2002;92:1648–1652)

ease state.<sup>4,8</sup> (In a historical context, it is interesting to note that metformin, used in treating diabetes, was derived from French lilac, a traditional remedy for the disease.<sup>9</sup>)

Despite the attention and interest, there are few data on the actual prevalence of CAM use among US residents with diabetes. To our knowledge, there has been only 1 report of CAM use in a nationally representative sample.<sup>10</sup> Other US surveys have involved convenience samples in specific clinics or communities or have examined subpopulations such as Hispanic Americans, who have higher reported prevalence rates of non-insulin-dependent diabetes.<sup>11–13</sup> Results of such studies have been inconsistent regarding use of traditional plant medicines or *curanderos* (traditional healers).

A recent Canadian study examining patients with type 1 and 2 diabetes who were enrolled in a diabetes education program showed that one third of these individuals were taking alternative medications they considered to be efficacious (e.g., vitamin supplements, herbal remedies), and this proportion was comparable to that among a nondiabetic control group.<sup>14</sup> This study, however, did not report on whether the patients’ CAM use was intended specifically for the treatment of dia-

betes. Our objective in the present study was to characterize general use of CAM, as well as use specifically for diabetes, among persons with diabetes residing in the United States.

## METHODS

Between November 1997 and February 1998, we conducted a nationally representative telephone survey designed to obtain information on use of CAM therapies for specific chronic conditions. Random-digit dialing was used to select households, and 1 member of each household, 18 years or older and English speaking, was randomly selected as the respondent. The final sample size was 2055 respondents (60% weighted response rate). Data were weighted to adjust for geographic variations in response rates, variations in household size, and probability of selection. The survey methods and sample design have been described in detail elsewhere.<sup>15</sup>

The instrument collected information on demographic characteristics, lifetime use of CAM, use of alternative therapies in the previous 12 months, perceived helpfulness of the therapies, and visits to conventional and CAM providers. A CAM provider was defined as a professional who is paid to administer care or

offer advice regarding a CAM therapy. We specifically inquired about 21 CAM therapies: acupuncture, chiropractic, homeopathy, herbal remedies, high-dose megavitamins, solitary prayer or spiritual practices, intercessory prayer or spiritual healing by others, commercial diet programs, self-help groups, relaxation/meditation, lifestyle diets, guided imagery, massage, energy healing, folk remedies, biofeedback, naturopathy, yoga, hypnosis, osteopathy, and aromatherapy. We also obtained information on 14 self-reported conditions: heart disease, kidney disease, neurological disease, diabetes, cancer, lung problems, digestive conditions, allergies, anxiety, depression, arthritis, back or neck problems, chronic headaches, and chronic pain.

In our analysis, we examined the demographic and clinical characteristics of patients with diabetes relative to those of individuals without diabetes. Among those with diabetes, we distinguished between use of CAM therapy for any purpose (non-condition-specific use) and use of CAM therapy for diabetes (condition-specific use). We also stratified analyses according to use of insulin. We used  $\chi^2$  tests of independence to compare proportions and *t* tests to examine continuous measures. To determine whether having diabetes was associated with use of 1 or more CAM therapies in the overall sample, we used weighted logistic regression analyses adjusting for sociodemographic factors (i.e., age, sex, race, income, education, region) previously reported as predictors of CAM use.<sup>15–17</sup>

In all of the statistical analyses, we used SAS-callable SUDAAN software (version 7.5.2; Research Triangle Institute, Research Triangle Park, NC) to obtain Taylor series linearization estimates accounting for the complex sampling scheme. We used household population data published by the Bureau of the Census (198 million adults in 1997)<sup>18</sup> to extrapolate survey estimates to the total US population.

## RESULTS

Of the 2055 respondents surveyed, 95 reported having diabetes mellitus (representing, through extrapolation, 5.3% of the adult US population), closely reflecting the reported prevalence of the disease at the time the sur-

vey was conducted.<sup>1</sup> As previously reported, sociodemographic characteristics of the survey sample were also similar to the 1997 population distributions published by the US Bureau of the Census.<sup>15,18</sup>

Data on the demographic and clinical characteristics of respondents with and without diabetes are shown in Table 1. The only statistically significant sociodemographic differences between the 2 groups involved age and income level; persons with diabetes tended to be older and to have lower incomes than those without diabetes. Of the patients with diabetes, most were diagnosed after the age of 25 years, and about one third required use of insulin. Respondents with diabetes were more likely than others to have concomitant renal disease, neurological disease, anxiety, depression, and arthritis.

Table 2 details the use of the 21 CAM therapies included among persons with and without diabetes. Of those with diabetes, 57% (an estimated 6 million people in the US population) reported use of 1 or more CAM therapies in the previous year. This non-condition-specific use was comparable to that among respondents without diabetes, with a large percentage using solitary prayer (46%) and smaller percentages using herbal therapies (16%) and relaxation/meditation (12%). Relative to those without the disease, however, persons with diabetes tended to report less use of spiritual healing (by others) and less use of homeopathy. Overall, after adjustment for age, sex, race, income, education, and region, having diabetes was not significantly associated with use of 1 or more CAM therapies in the previous 12 months in either bivariate or multivariate analyses (adjusted odds ratio [OR] = 0.9; 95% confidence interval [CI] = 0.6, 1.5).

Thirty-five percent of the respondents with diabetes reported CAM use specifically for treatment of the disease (an estimated 3.6 million people in the US population). This condition-specific CAM use primarily involved solitary prayer or other spiritual practices (28%), although there was modest use of commercial diet programs for weight loss or gain and modest use of herbal therapies (about 6%–7% each). Only a few respondents reported use of folk remedies, self-help groups, relaxation/meditation, high-dose

megavitamins, and homeopathy for diabetes. No respondents reported use of chiropractic, acupuncture, lifestyle diets, yoga, or massage for diabetes. Stratified analyses showed no significant differences between insulin-treated patients and non-insulin-treated patients in rates of CAM use in the past year.

Among those who had used 1 or more CAM therapies for diabetes in the previous year, 60.6% (SE = 9.7%) found at least 1 of the therapies to be “very helpful”; 26.5% (SE = 8.9%) had seen a CAM professional for their disease. In contrast, 71.6% (SE = 12.5%) had visited a medical physician or doctor of osteopathy in the previous year. Of the patients who used solitary prayer or spiritual practices for diabetes, 53.8% (SE = 11.5%) found prayer to be “very helpful.” Among those who had used any of the remaining therapies (excluding solitary prayer) for diabetes, 38.3% (SE = 13.4%) found at least 1 of the therapies to be “very helpful.”

## DISCUSSION

Our analysis suggests that although persons with diabetes use CAM therapies at a rate similar to that among the general population, they do not seem to be using CAM specifically for their diabetes. With the exception of solitary prayer, reported CAM use for the treatment of diabetes was relatively uncommon.

Previous studies of CAM use among persons with diabetes have been limited to convenience samples or highly selected ethnic populations. These studies have reported a wide range of CAM use, from use of herbs among 9% of low-income Mexican American patients in Texas<sup>12</sup> to use of “traditional home remedies” among 65% of immigrant Vietnamese patients in California.<sup>19</sup> In the only other national study, Egede and colleagues, using the 1996 Medical Expenditure Panel Survey, reported that 8% of persons with diabetes used CAM, a rate considerably lower than our estimate.<sup>10</sup> Their analysis, however, was limited to CAM use in association with a professional visit and thus probably understated overall CAM use.

In contrast, surveys of other specific populations have suggested higher rates of CAM use among persons with various chronic conditions (e.g., 42% among patients with

**TABLE 1—Demographic and Clinical Characteristics of Respondents Without (n = 1960) and With (n = 95) Diabetes**

	Respondents Without Diabetes	Respondents With Diabetes	P
Demographic characteristics			
Mean age, y	43.5	57	<.01
Sex, %			.09
Female	51.7	61.5	
Male	48.3	38.5	
Race, %			NS
White	77.2	71.7	
African American	8.2	10.4	
Hispanic	10.4	7.4	
Asian	1.2	1.0	
Other	3.0	9.5	
Education, %			.06
Less than high school	13.1	23.0	
High school	41.9	43.9	
College or more	45.0	33.1	
Annual income, \$, %			<.01
<20000	23.8	47.6	
20000–49999	43.3	24.3	
50000 or more	25.5	19.1	
Don't know/refused	7.4	9.0	
Region, %			NS
Northeast	21.3	23.2	
North Central	23.7	20.9	
South	35.1	40.5	
West	19.9	15.4	
Clinical characteristics			
Use of insulin, %	...	30	...
Diabetes diagnosed after age 25, y, %	...	91	...
Concomitant heart disease, %	8.9	17.4	.08
Renal disease	4.3	11.8	.05
Neurological disease	1.4	11.0	.02
Cancer	1.3	2.8	NS
Lung disease	14.0	24.0	.06
Digestive problems	14.3	17.8	NS
Allergies	29.4	27.5	NS
Anxiety	10.0	19.7	.05
Depression	8.2	18.7	.04
Arthritis	20.3	49.9	<.01
Back/neck pain	32.6	34.2	NS
Chronic headache	16.7	14.4	NS
Chronic pain	8.1	14.6	NS

Note. NS = nonsignificant (value > .1).

For example, Fairfield et al. found that many patients with HIV use CAM to relieve pain, neuropathy, stress, depression, and nausea that might be associated with the primary illness; however, few use CAM for specific antiviral effects or to cure HIV.<sup>23</sup> Nonetheless, previous studies involving our national survey<sup>15</sup> have reported condition-specific prevalence rates of CAM use (excluding solitary prayer) among patients with back or neck pain (54%),<sup>25</sup> anxiety (57%),<sup>26</sup> and depression (54%)<sup>26</sup> that are consistently higher than our rate of 20% among those with diabetes. These data suggest that CAM therapy use for diabetes is much less prevalent than that for other chronic conditions.

Our results showed that, regardless of condition, many people used solitary prayer as a form of therapy. This finding is not surprising, in that previous literature suggests that a high percentage of patients, as well as physicians, believe that personal spiritual practices can play an important role in health and illness.<sup>27,28</sup> It should be noted, however, that some do not consider solitary prayer to be a CAM therapy, and it is sometimes excluded from analyses, such as in the original article describing the present survey (Eisenberg et al.<sup>15</sup>). Thus, we have presented data both with and without inclusion of solitary prayer.

After solitary prayer, the next most common therapy used was herbal remedies, although condition-specific use of herbs was relatively low. These results are similar to the findings of Hunt et al., who surveyed Mexican Americans with type 2 diabetes and reported that although most patients were aware of a variety of alternative treatments for diabetes and could list several potentially beneficial herbs, few reported regularly using them.<sup>12</sup> Similarly, a study conducted by Ryan et al. showed that a substantial proportion of patients with diabetes used herbal remedies and supplements (such as glucosamine for arthritis or echinacea for respiratory infections), but few used herbs that have been reported to be beneficial for diabetes (such as fenugreek (*Trigonella*) seeds or *Gymnema sylvestre* (gurmar)).<sup>14</sup>

Why patients choose to use CAM therapies for 1 condition over another is an important and interesting question. Reasons are likely to be multifactorial but may relate to

asthma/rhinosinusitis,<sup>20,21</sup> 80% among those with cancer,<sup>22</sup> 68% among those with HIV,<sup>23</sup> and 54% among those with amyotrophic lat-

eral sclerosis<sup>24</sup>). However, it is not always clear whether use is condition specific, and in some instances this may be difficult to define.

**TABLE 2—Use of Complementary and Alternative Medicine (CAM) Therapies in the Previous 12 Months by Respondents Without (n = 1960) and With (n = 95) Diabetes**

Type of Therapy	Non-Condition-Specific Use, % (SE)		<i>p</i> <sup>b</sup>	Condition-Specific Use, % (SE), <sup>a</sup> Among Respondents With Diabetes
	Respondents Without Diabetes	Respondents With Diabetes		
Prayer/spiritual practice	34.9 (1.2)	45.9 (5.7)	.06	28.2 (5.4)
Relaxation/meditation	16.6 (0.9)	11.7 (3.5)	NS	2.0 (1.5)
Herbal therapies	11.9 (0.8)	16.2 (4.3)	NS	6.6 (2.9)
Massage	11.4 (0.8)	6.9 (3.1)	NS	0.0 (0.0)
Chiropractic	11.2 (0.8)	8.1 (2.9)	NS	0.0 (0.0)
Folk remedies	4.2 (0.5)	5.1 (2.5)	NS	2.9 (2.9)
Commercial diet	4.4 (0.5)	5.8 (2.5)	NS	6.4 (2.9)
Spiritual healing by others	7.3 (0.7)	1.6 (0.9)	.01	0.0 (0.0)
Aromatherapy	5.8 (0.6)	2.2 (1.9)	NS	0.0 (0.0)
High-dose megavitamin	5.5 (0.6)	5.9 (2.7)	NS	1.7 (1.2)
Self-help groups	5.0 (0.6)	2.0 (1.2)	NS	2.3 (1.3)
Imagery/guided imagery	4.7 (0.5)	1.5 (1.2)	NS	0.0 (0.0)
Lifestyle diet <sup>c</sup>	4.2 (0.5)	1.0 (0.8)	.06	0.0 (0.0)
Energy healing <sup>d</sup>	4.0 (0.5)	0.6 (0.6)	.06	0.0 (0.0)
Yoga	3.8 (0.5)	1.3 (0.9)	NS	0.0 (0.0)
Homeopathy	3.7 (0.5)	0.4 (0.4)	.03	0.7 (0.7)
Hypnosis	1.2 (0.3)	0.0 (0.0)	NS	0.0 (0.0)
Acupuncture	1.1 (0.3)	0.0 (0.0)	NS	0.0 (0.0)
Biofeedback	1.0 (0.3)	0.4 (0.4)	NS	0.0 (0.0)
Naturopathy	0.7 (0.2)	0.0 (0.0)	NS	0.0 (0.0)
Osteopathy	0.5 (0.2)	0.0 (0.0)	NS	0.0 (0.0)
≥1 of 21 CAM therapies (including self-prayer)	54.5 (1.3)	56.8 (5.6)	NS	34.8 (5.6)
≥1 of 20 CAM therapies (excluding self-prayer)	43.7 (1.3)	38.7 (5.5)	NS	20.0 (4.9)

Note. NS = nonsignificant (value > 1).

<sup>a</sup>Only a subset of those respondents asked about non-condition-specific use were asked about condition-specific use.

Therefore, in some instances, condition-specific use could appear to be higher than non-condition-specific use.

<sup>b</sup>Comparison of non-condition-specific CAM therapy use between respondents with and without diabetes.

<sup>c</sup>For example, vegetarianism, yeast-free diet, macrobiotics.

<sup>d</sup>For example, magnets, energy machines, laying of hands.

perceptions of disease severity, symptoms, and disease understanding. In addition, treatment knowledge, availability, and acceptability, in the case of both conventional and alternative approaches, are likely to influence patients' decisions. For example, patients may believe that conventional medicine has a good understanding of diabetes and can offer successful pharmaceuticals for disease management, so there is less need for other therapies. In contrast, conditions such as chronic pain may be less well understood, and conventional remedies are often unsatisfactory. In the case of conditions such as HIV or can-

cer, conventional treatments may be less acceptable owing to treatment-related toxicities. In such instances, CAM therapies might appear to be attractive options.

Alternatively, patients might be less compelled to seek a CAM therapy or any other medical therapy if they have relatively few symptoms. Unlike other conditions involving acute symptomatic crises, such as asthma or pain syndromes, the only reminder of the presence of diabetes may be an abnormal blood sugar value, particularly early in the course of the disease. Another explanation may relate to the hypothesis that many CAM

therapies are attractive to patients because of the therapies' self-empowering, participatory approaches to care.<sup>17</sup> This self-care aspect may already be offered to patients through conventional diabetes care (e.g., diabetes self-management education).

On the other hand, perhaps patients are fearful of potential adverse effects associated with CAM therapy use in the setting of a serious illness. There have been only a limited number of toxicity reports involving CAM therapy use in diabetes.<sup>29–33</sup> One case report documented renal failure with use of the dietary supplement chromium picolinate,<sup>29</sup> a second documented hepatotoxicity with ingestion of sheep bile,<sup>32</sup> and a third described a group of patients who experienced poor outcomes after abruptly stopping insulin injection to initiate various CAM therapies.<sup>33</sup>

Further understanding of these complex issues, including patients' motivations for choosing certain CAM therapies, might help health care professionals make more informed clinical decisions and perhaps provide better care. Our analysis showed that whereas only a quarter of patients had seen a CAM professional for their diabetes in the previous year, more than two thirds had seen a conventional provider, suggesting that patients continue to regard conventional providers as the principal coordinators of their medical care.

Our study is limited by the relatively small sample of persons with diabetes. Because general population estimates for some CAM therapies are low (e.g., acupuncture is used by only 1%–2% of the general population), one might not expect to detect this low incidence in a sample of 95 respondents. In addition, our data relied on respondents' self-reports of their health conditions and use of therapies, and these self-reports may have been subject to error or recall bias. We also cannot specify whether patients had type 1 or type 2 diabetes, although age at diagnosis and use of insulin provided some helpful descriptive information.

Our list of 21 CAM therapies was not exhaustive. Although we included many well known alternative therapies and allowed respondents an opportunity to specify "others," we may have excluded some lesser known therapies, and this could have falsely lowered our estimates of overall CAM therapy use.

Finally, our survey was limited to English-speaking respondents. Excluding individuals who spoke other languages and who were from more ethnically diverse backgrounds might have resulted in omission of individuals more inclined to use alternative remedies from their own cultural backgrounds.

Approximately 6 million US adults with diabetes use CAM therapies; this estimate is probably low, in that it was based on 1997–1998 population figures, and both rates of diabetes and rates of CAM use are increasing.<sup>1,15</sup> Overall, our results showed that CAM use rates are similar among those with and without diabetes. However, a large proportion of CAM therapy use involves treatment of conditions other than diabetes. Nonetheless, those who do use CAM for diabetes have found the therapies to be generally helpful.

Fortunately, agencies such as the National Center for Complementary and Alternative Medicine of the National Institutes of Health have recognized the need for further investigation, and research on CAM therapies that have potential benefits for diabetes is beginning to emerge.<sup>4,34,35</sup> Additional understanding of patterns of CAM therapy use among persons with diabetes will not only help health professionals provide more informed clinical care but also help policymakers create relevant frameworks for future policy and guide investigators in the further development of CAM research. ■

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### Contributors

G. Y. Yeh and R. S. Phillips contributed to study concept and design, data analysis and interpretation, and critical revision of the article. G. Y. Yeh also drafted the article and provided statistical expertise. D. M. Eisenberg and R. B. Davis contributed to data analysis and interpretation and to critical revision of the article. R. B. Davis also provided statistical expertise.

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### Human Participant Protection

Survey methods were approved by the Beth Israel Deaconess Institutional Review Board, Boston, Mass.

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